

Effect of Certain Dwarfing Rootstocks on Selected Ornamental Crabapples

G.A. Moulton, L.J. Price, and J. King

WSU Mount Vernon Northwestern Washington Research & Extension Center

Introduction

Disease resistant ornamental crabapples now available are hardy, versatile, and well adapted to both home garden and public plantings such as parks, plazas and urban streets. Such uses call for a wide range of tree sizes, and for better control of the tree size in a specific location. Research specific to crabapples is needed, because the known dwarfing effects of some apple rootstocks in dessert apples arise partly from the fact that they induce early, heavy fruit set. The effect of this on crabapples, with their smaller fruit weight compared to yields of standard apple, is unclear.

This research examined the effects of different size-controlling apple rootstocks on grafted crabapple varieties that have demonstrated high levels of disease resistance over 12 years of evaluation in a mild humid maritime climate. Among the factors tested were the compatibility of specific cultivars and rootstocks, disease resistance of stock and scion, whether adequate vigor can be sustained for trees on the more dwarfing rootstocks, and if tree supports are needed. The objective of this selective rootstock trial is to provide nurseries with relevant information on the performance of size controlling rootstocks when grafted to several of the newer disease resistant varieties of crabapple.

A trial plot was established in 1997, data in the form of trunk diameter measurements was collected annually, and the trial was concluded in 2001.

Methods

In 1997 a planting was established at WSU Mount Vernon NWREC. The planting consisted of 6 promising disease resistant crabapple varieties grafted to 6 different size-controlling rootstocks, each combination of variety and rootstock replicated 4 times (Table 1).

Table 1. Cultivar/species and rootstocks¹ included in trial.

Cv/Species	M27	M9	M26	M111	B118	DS	B490	CG228	CG778
Christmas Holly	x	x	x	x	x	x	x		
Evereste	x	x	x	x	x	x		x	
Golden Raindrops	x	x	x	x	x	x	x		
<i>M. x zumi 'calocarpa'</i>	x*	x	x	x	x	x			x*
Molten Lava	x	x	x	x	x	x			
Prairifire	x	x	x	x	x	x		x	
Sugar Tyme	x	x	x	x	x	x		x	

*young grafts 1998

¹The rootstocks in the trial are M27, M9, M26, M111, Budagovski 118 (B118), and domestic seedling (DS). Rootstocks Budagovski 490 (B490), Cornell Geneva 228 (CG228), and Cornell Geneva 778 (CG778) were included for comparison but not fully replicated for all crabapple taxa.

The rootstocks were chosen to give as full a size range as possible, from the largest (Domestic seedling) to the smallest (M27). Some additional rootstocks were included for observation, with fewer replications: Budagovski 490, Cornell Geneva 778 and Cornell Geneva 228. These rootstocks were selected for characteristics such as disease resistance, good trunk support, and few root suckers. The crabapple varieties and species were selected for proven disease resistance and ornamental quality in evaluations for the National Crabapple Evaluation Project from 1984 to 1996. ‘Prairifire’ has bright pink flowers; the other 5 are white-flowered. The trees vary in habit from the small and compact to large spreading and semi-weeping types (Table 2.)

Table 2. Characteristics of crabapple taxa selected for trial.

Name	Bloom Color	Bloom Time	Tree Habit	Fruit Color
Sugar Tyme	white	early	large upright	red
Evereste	white	mid	mid upright spreading	red, large
<i>M. x zumi 'calocarpa'</i>	white	mid	large spreading	red
Molten Lava	white	mid-late	large semi -weeping	red
Christmas Holly	white	mid-late	small compact	red
Prairifire	red-pink	late	mid spreading	dark red
Golden Raindrops	white	late	mid spreading	yellow

Data collected included annual measurements of trunk diameter, observations of tree height and vigor, disease susceptibility, graft compatibility, and any other observations such as possible effect on bloom time or abundance.

Results

Trunk diameters were measured at 30 cm. above ground level after planting in April 1997 as a baseline for future comparison, in February 1998, December 1998, April 2000, and January 2001 (Table 3).

Table 3. Mean trunk diameters at 30 cm. AGL for six crabapple cultivars grafted on six size controlling rootstocks at WSU Mount Vernon 1997-2001.

Cultivar	Rootstock	4/97	2/98	12/98	4/00	1/01
Sugar Tyme	M27	0.98	1.54	2.00	2.43	2.72
	M9	1.23	1.58	2.18	2.67	2.77
	M26	1.33	2.21	2.73	3.65	3.72
	B118	1.73	2.18	2.95	3.86	4.20
	M111	1.58	2.44	3.20	3.71	4.06
	Dom. Sdlg.	1.18	2.30	2.70	3.70	3.78
Evereste	M27	1.25	1.92	2.00	2.46	2.86
	M9	1.38	2.18	2.55	3.27	4.21
	M26	1.35	2.14	2.48	3.49	4.59
	B118	1.80	2.75	3.08	4.48	5.89
	M111	1.58	2.68	2.88	4.31	5.62
	Dom. Sdlg.	1.45	2.27	2.83	4.30	5.66
Molten Lava	M27	1.07	1.51	1.80	2.15	2.25

	M9	missing	0.77	1.53	2.13	2.69
	M26	1.05	1.71	2.25	2.87	3.45
	B118	1.38	2.01	3.03	4.00	4.16
	M111	1.25	1.99	2.65	3.36	3.82
	Dom. Sdlg.	1.40	1.91	2.78	3.84	4.77
<i>M. zumi x calocarpa</i>	M27	missing	missing	2.20	2.15	3.04
	M9	1.00	1.75	2.30	3.11	3.69
	M26	1.45	2.32	2.98	4.14	4.82
	B118	1.28	2.06	3.10	4.73	5.95
	M111	1.28	2.23	3.15	4.57	5.79
	Dom. Sdlg.	1.35	1.92	2.65	3.91	5.42
Christmas Holly	M27	0.87	1.52	1.70	1.66	1.83
	M9	1.00	1.47	2.00	2.73	3.11
	M26	0.98	1.72	2.40	3.15	3.59
	B118	1.45	2.26	2.98	3.96	4.90
	M111	0.93	1.88	2.40	2.98	3.91
	Dom. Sdlg.	1.10	1.83	2.53	3.83	4.64
Prairifire	M27	1.45	1.45	1.78	2.05	2.10
	M9	1.31	1.31	1.90	2.15	2.61
	M26	1.57	1.57	2.25	2.94	3.46
	B118	1.98	1.98	2.83	3.97	4.77
	M111	1.96	1.96	2.70	3.83	4.89
	Dom. Sdlg.	1.03	1.82	2.38	3.23	4.12
Golden Raindrops	M27	1.13	1.92	2.18	3.14	4.13
	M9	1.18	2.04	2.57	3.75	4.79
	M26	1.20	2.06	2.78	3.97	4.83
	B118	1.40	2.51	3.35	4.84	6.08
	M111	1.18	2.36	3.43	5.25	6.65
	Dom. Sdlg.	1.40	2.34	3.08	4.36	5.87

Discussion

Data were not statistically analyzed, but indicate a size range for the rootstocks that is relatively consistent across the varieties. The data also reveal variations in amount and rate of growth between the different cultivars after 4 ½ years in-ground (see Appendix, Tables 4-8). Due to a lack of funding support, the trial, originally scheduled to continue until 2003, was concluded in 2001.

Acknowledgements

This trial was established with funding from the Horticultural Research Institute, and ongoing support from the J. Frank Schmidt Family Charitable Trust and the Washington State Department of Agriculture is gratefully acknowledged.

APPENDIX:

Table 4. Crabapple rootstock diameters measured at 30 cm. above ground level in April 1997 at WSU Mount Vernon NWREC.

Cultivar	Rootstock	Rep A	Rep B	Rep C	Rep D	AVG
Sugar Tyme	M27	0.9	1.0	1.1	0.9	0.98
Sugar Tyme	M9	1.1	1.0	1.4	1.4	1.23
Sugar Tyme	M26	1.3	1.2	1.3	1.5	1.33
Sugar Tyme	B118	1.6	2.2	1.5	1.6	1.73
Sugar Tyme	M111	1.2	1.6	1.8	1.7	1.58
Sugar Tyme	CG228	1.5	1.8	1.5	1.5	1.58
Sugar Tyme	DomSdl	1.2	0.9	1.3	1.3	1.18
Evereste	M27	1.1	1.3	1.3	1.3	1.25
Evereste	M9	1.5	1.5	1.1	1.4	1.38
Evereste	M26	1.4	1.6	1.1	1.3	1.35
Evereste	B118	1.7	1.9	1.9	1.7	1.80
Evereste	M111	1.5	1.6	1.5	1.7	1.58
Evereste	CG228	1.9	1.5	1.8	1.5	1.68
Evereste	DomSdl	1.7	1.3	1.2	1.6	1.45
Molten Lava	M27	1.1	1	1.1	Graft	1.07
Molten Lava	M9	Graft	Graft	Graft	Graft	
Molten Lava	M26	0.9	1.0	1.1	1.2	1.05
Molten Lava	B118	1.4	1.4	1.4	1.3	1.38
Molten Lava	M111	1.3	1.2	1.3	1.2	1.25
Molten Lava	CG228	1.3	1.4	1.2	1.6	1.38
Molten Lava	DomSdl	1.5	1.2	1.6	1.3	1.40
<i>M. zumi x calocarpa</i>	M27	0.9	Graft	Graft	Graft	
<i>M. zumi x calocarpa</i>	M9	1.2	1.1	0.9	0.8	1.00
<i>M. zumi x calocarpa</i>	M26	1.4	1.2	1.4	1.8	1.45
<i>M. zumi x calocarpa</i>	B118	1.2	1.2	1.1	1.6	1.28
<i>M. zumi x calocarpa</i>	M111	1.2	0.9	1.6	1.4	1.28
<i>M. zumi x calocarpa</i>	CG778	Graft	Graft	missing	1.2	---
<i>M. zumi x calocarpa</i>	DomSdl	1.3	1.3	1.4	1.4	1.35
Christmas Holly	M27	0.8	0.8	1.0	Graft	0.87
Christmas Holly	M9	1.0	1.1	0.8	1.1	1.00
Christmas Holly	M26	1.1	1.0	0.9	0.9	0.98
Christmas Holly	B118	1.5	1.4	1.5	1.4	1.45
Christmas Holly	M111	1.0	0.9	0.8	1.0	0.93
Christmas Holly	B490	1.0	1.2	1.0	1.0	1.05
Christmas Holly	DomSdl	1.0	1.0	1.1	1.3	1.10
Prairifire	M27	0.9	0.9	1	1	0.95
Prairifire	M9	0.8	0.8	0.6	0.2	0.73
Prairifire	M26	0.9	0.9	0.7	1.1	0.90
Prairifire	B118	1.1	1.1	1.3	1.2	1.18
Prairifire	M111	1.0	1.0	1.0	1.2	1.05
Prairifire	CG228	1.0	1.2	1.0	1.0	1.05
Prairifire	DomSdl	1.0	1.1	1.0	1.0	1.03
Golden Raindrops	M27	1.5	1	1	1	1.13

Golden Raindrops	M9	1.2	0.9	1.2	1.4	1.18
Golden Raindrops	M26	1.1	1.1	1.2	1.4	1.20
Golden Raindrops	B118	1.6	1.1	1.5	1.4	1.40
Golden Raindrops	M111	1.1	1.1	1.3	1.2	1.18
Golden Raindrops	B490	1.3	1.4	1.4	1.4	1.38
Golden Raindrops	DomSdl	1.4	1.2	1.6	1.4	1.40

Table 5. Crabapple rootstock diameters measured at 30 cm. above ground level in February 1998 at WSU Mount Vernon NWREC.

Cultivar	Rootstock	Rep A	Rep B	Rep C	Rep D	AVG
Sugar Tyme	M27	1.29	1.69	1.58	1.6	1.54
Sugar Tyme	M9	0.63*	1.48	1.67	1.6	1.58
Sugar Tyme	M26	2.11	2.27	2.1	2.37	2.21
Sugar Tyme	B118	1.82	2.75	2	2.16	2.18
Sugar Tyme	M111	2.21	2.74	2.23	2.59	2.44
Sugar Tyme	CG228	2.44	2.89	2.11	2.41	2.46
Sugar Tyme	DomSdl	2.15	2.25	2.01	2.77	2.30
Evereste	M27	1.92	1.99	1.7	2.05	1.92
Evereste	M9	2.65	2.08	1.83	2.15	2.18
Evereste	M26	2.02	2.1	2.09	2.36	2.14
Evereste	B118	3.26	2.55	2.31	2.87	2.75
Evereste	M111	3.12	2.69	2.39	2.51	2.68
Evereste	CG228	3.56	2.29	2.6	2.83	2.82
Evereste	DomSdl	2.42	2.38	1.39	2.88	2.27
Molten Lava	M27	1.43	1.53	1.57	missing	1.51
Molten Lava	M9	0.76*	0.79*	0.75*	0.76*	0.77
Molten Lava	M26	1.46	1.83	1.92	1.61	1.71
Molten Lava	B118	1.95	2.12	2.05	1.9	2.01
Molten Lava	M111	1.96	1.9	2	2.09	1.99
Molten Lava	CG228	2.23	1.84	1.73	1.93	1.93
Molten Lava	DomSdl	1.93	1.91	2.04	1.76	1.91
<i>M. zumi x calocarpa</i>	M27	1.58	missing	0.71*	missing	----
<i>M. zumi x calocarpa</i>	M9	1.87	2.03	1.57	1.52	1.75
<i>M. zumi x calocarpa</i>	M26	2.65	1.99	2.04	2.61	2.32
<i>M. zumi x calocarpa</i>	B118	1.93	2.18	1.88	2.23	2.06
<i>M. zumi x calocarpa</i>	M111	2.53	2.12	2.2	2.08	2.23
<i>M. zumi x calocarpa</i>	CG778	0.71*	0.63*	0.55*	1.74	0.63*
<i>M. zumi x calocarpa</i>	DomSdl	2.34	1.5	1.99	1.86	1.92
Christmas Holly	M27	1.75	1.28	1.52	0.46*	1.52
Christmas Holly	M9	1.58	1.48	1.2	1.63	1.47
Christmas Holly	M26	1.72	1.63	1.62	1.91	1.72
Christmas Holly	B118	2.35	2.28	2.11	2.29	2.26
Christmas Holly	M111	1.91	1.92	1.77	1.9	1.88
Christmas Holly	B490	2.12	2.14	1.77	1.85	1.97
Christmas Holly	DomSdl	1.44	1.84	1.84	2.2	1.83
Prairifire	M27	1.59	1.56	1.25	1.41	1.45
Prairifire	M9	1.51	1.28	1.15	0.91*	1.31
Prairifire	M26	1.74	1.47	1.5	1.58	1.57

Prairifire	B118	2.18	2.06	1.73	1.95	1.98
Prairifire	M111	1.88	2.13	1.87	1.96	1.96
Prairifire	CG228	1.74	1.88	1.74	1.65	1.75
Prairifire	DomSdl	1.96	2.07	1.55	1.7	1.82
Golden Raindrops	M27	2.49	1.84	1.42	1.92	1.92
Golden Raindrops	M9	missing	2.06	1.89	2.17	2.04
Golden Raindrops	M26	1.86	2.19	1.89	2.3	2.06
Golden Raindrops	B118	2.93	2.37	2.13	2.62	2.51
Golden Raindrops	M111	2.6	2.26	2.25	2.33	2.36
Golden Raindrops	B490	2.47	2.39	2.08	2.17	2.28
Golden Raindrops	DomSdl	2.85	1.93	2.23	2.34	2.34

Table 6. Crabapple rootstock diameters measured at 30 cm. above ground level in December 1998 at WSU Mount Vernon NWREC.

Cultivar	Rootstock	Rep A	Rep B	Rep C	Rep D	AVG
Sugar Tyme	M27	2.0	1.9	2.1	2.0	2.0
Sugar Tyme	M9	2.2	2.3	2.1	2.1	2.18
Sugar Tyme	M26	2.5	3.0	2.6	2.8	2.73
Sugar Tyme	B118	2.5	3.6	3.1	2.6	2.95
Sugar Tyme	M111	3.0	3.3	3.2	3.3	3.20
Sugar Tyme	CG228	2.6	3.1	2.2	2.9	2.70
Sugar Tyme	DomSdl	2.5	2.6	2.5	3.2	2.70
Evereste	M27	1.8	1.9	2.2	2.1	2
Evereste	M9	3.1	2.6	1.8	2.7	2.55
Evereste	M26	2.6	2.4	2.3	2.6	2.48
Evereste	B118	3.1	3.3	2.9	3	3.08
Evereste	M111	3.1	3.2	2.6	2.6	2.88
Evereste	CG228	3.8	2.7	3.0	2.9	3.10
Evereste	DomSdl	3.0	2.7	2.5	3.1	2.83
Molten Lava	M27	1.9	1.8	1.7	missing	1.80
Molten Lava	M9	1.8	1.6	1.6	1.1	1.53
Molten Lava	M26	1.9	2.4	2.5	2.2	2.25
Molten Lava	B118	2.9	3.6	3.1	2.5	3.03
Molten Lava	M111	2.8	2.7	2.6	2.5	2.65
Molten Lava	CG228	2.6	2.3	2.1	2.4	2.35
Molten Lava	DomSdl	3.0	2.8	3.0	2.3	2.78
<i>M. zumi x calocarpa</i>	M27	2.2	missing	missing	missing	2.20
<i>M. zumi x calocarpa</i>	M9	2.4	2.4	2.1	2.3	2.30
<i>M. zumi x calocarpa</i>	M26	2.9	2.6	3.0	3.4	2.98
<i>M. zumi x calocarpa</i>	B118	2.9	3.0	3.4	3.1	3.10
<i>M. zumi x calocarpa</i>	M111	3.2	2.6	3.4	3.4	3.15
<i>M. zumi x calocarpa</i>	CG778	1.8	1.7	1.6	2.2	1.83
<i>M. zumi x calocarpa</i>	DomSdl	2.9	1.9	3.2	2.6	2.65
Christmas Holly	M27	1.9	1.4	1.8	0.7*	1.70
Christmas Holly	M9	2.0	2.2	1.7	2.1	2.00
Christmas Holly	M26	2.6	2.2	2.3	2.5	2.40
Christmas Holly	B118	3.2	2.9	2.9	2.9	2.98
Christmas Holly	M111	2.2	2.6	2.4	2.4	2.40

Christmas Holly	B490	2.7	2.6	2.9	2.6	2.70
Christmas Holly	DomSdl	2.1	2.5	2.6	2.9	2.53
Prairifire	M27	2.0	1.8	1.6	1.7	1.78
Prairifire	M9	2.1	2.0	2.0	1.5	1.90
Prairifire	M26	2.4	2.2	2.1	2.3	2.25
Prairifire	B118	3.3	2.7	2.7	2.6	2.83
Prairifire	M111	2.6	2.9	2.5	2.8	2.70
Prairifire	CG228	2.3	2.8	2.3	2.4	2.45
Prairifire	DomSdl	2.5	2.7	2.1	2.2	2.38
Golden Raindrops	M27	2.1	2.4	1.8	2.4	2.18
Golden Raindrops	M9	missing	2.6	2.3	2.8	2.57
Golden Raindrops	M26	2.7	3.2	2.4	2.8	2.78
Golden Raindrops	B118	4.0	3.3	3.0	3.1	3.35
Golden Raindrops	M111	3.6	3.2	3.2	3.7	3.43
Golden Raindrops	B490	3.5	3.5	3.1	3.6	3.43
Golden Raindrops	DomSdl	3.4	2.7	2.8	3.4	3.08

Table 7. Crabapple rootstock diameters measured at 30 cm. above ground level in April 2000 at WSU Mount Vernon NWREC.

Cultivar	Rootstock	Rep A	Rep B	Rep C	Rep D	AVG
Sugar Tyme	M27	2.6	2.1	dead	2.6	2.43
Sugar Tyme	M9	2.6	2.8	2.3	2.8	2.67
Sugar Tyme	M26	3.3	3.8	3.9	3.8	3.65
Sugar Tyme	B118	3.4	5.0	3.9	3.2	3.86
Sugar Tyme	M111	4.1	4.0	3.4	4.3	3.97
Sugar Tyme	CG228	4.0	4.0	2.8	4.1	3.71
Sugar Tyme	DomSdl	3.2	3.7	3.3	4.6	3.70
Evereste	M27	2.31	1.99	3	2.54	2.46
Evereste	M9	3.83	3.37	2.69	3.2	3.27
Evereste	M26	3.95	3.05	3.07	3.89	3.49
Evereste	B118	4.45	4.89	4.32	4.24	4.48
Evereste	M111	5.09	4.87	3.62	3.64	4.31
Evereste	CG228	4.54	4.52	3.69	3.64	4.10
Evereste	DomSdl	4.67	4.24	3.62	4.67	4.30
Molten Lava	M27	2.27	2.02	dead	msg	2.15
Molten Lava	M9	dead	2.25	2.01	dead	2.13
Molten Lava	M26	2.27	3.31	2.87	3.03	2.87
Molten Lava	B118	3.7	4.47	3.82	2.58 wk	4.00
Molten Lava	M111	3.17	3.54	dead	dead	3.36
Molten Lava	CG228	2.72	3.01	2.29	2.87	2.72
Molten Lava	DomSdl	3.88	3.94	3.71	dead	3.84
M. zumi x calocarpa	M27	2.78	msg	1.51	msg	2.15
M. zumi x calocarpa	M9	3.56	3.37	2.86	2.63	3.11
M. zumi x calocarpa	M26	4.24	3.07	4.18	5.07	4.14
M. zumi x calocarpa	B118	4.63	4.53	5.02	4.73	4.73
M. zumi x calocarpa	M111	4.55	4.26	4.83	4.64	4.57
M. zumi x calocarpa	CG778	3.21	2.87	msg	3.21	3.10
M. zumi x calocarpa	DomSdl	4.32	msg	4.73	msg	3.91
Christmas Holly	M27	1.87	1.45	dead	dead	1.66
Christmas Holly	M9	2.62	3.22	2.47	2.61	2.73
Christmas Holly	M26	3.61	2.6	2.02 wk	3.24	3.15

Christmas Holly	B118	4.7	3.95	3.32	3.86	3.96
Christmas Holly	M111	3.02	3.76	2.62	2.53	2.98
Christmas Holly	B490	3.67	3.62	3.66	3.99	3.74
Christmas Holly	DomSdl	3.52	3.67	3.84	4.28	3.83
Prairifire	M27	2.21	2.08	1.85	dead	2.05
Prairifire	M9	2.66	2.1	2.4	1.43	2.15
Prairifire	M26	3.2	2.72	2.91	2.94	2.94
Prairifire	B118	4.65	3.53	3.97	3.72	3.97
Prairifire	M111	3.55	4.13	3.78	3.85	3.83
Prairifire	CG228	3.36	3.69	3.26	3.08	3.35
Prairifire	DomSdl	3.57	3.6	2.73	3.01	3.23
Golden Raindrops	M27	2.89	3.32	dead	3.22	3.14
Golden Raindrops	M9	msg	dead	3.43	4.07	3.75
Golden Raindrops	M26	3.42	4.52	2.63 wk	3.96	3.97
Golden Raindrops	B118	5.76	5.01	3.95	4.62	4.84
Golden Raindrops	M111	6.32	4.82	4.53	5.34	5.25
Golden Raindrops	B490	5.22	5.14	3.87	5.16	4.85
Golden Raindrops	DomSdl	4.99	4.22	3.93	4.28	4.36

Table 8. Crabapple rootstock diameters measured at 30 cm. above ground level in January 2001 at WSU Mount Vernon NWREC.

Cultivar	Rootstock	Rep A	Rep B	Rep C	Rep D	AVG
Sugar Tyme	M27	2.9	2.18	dead	3.08	2.72
Sugar Tyme	M9	2.79	2.87	2.5	2.93	2.77
Sugar Tyme	M26	3.31	3.77	3.97	3.81	3.72
Sugar Tyme	B118	3.7	5.25	4.5	3.33	4.2
Sugar Tyme	M111	4.16	4.28	3.28	4.52	4.06
Sugar Tyme	CG228	4.48	4.25	2.89	4.48	4.03
Sugar Tyme	DomSdl	3.7	3.78	3.34	4.3	3.78
Evereste	M27	2.67	2.4	3.82	2.53	2.86
Evereste	M9	4.27	5.11	3.41	4.06	4.21
Evereste	M26	4.98	4.25	4.01	5.1	4.59
Evereste	B118	4.85	6.55	6.09	6.04	5.89
Evereste	M111	5.77	6.53	4.81	5.37	5.62
Evereste	CG228	6.35	6.18	5.19	5.21	5.73
Evereste	DomSdl	6.34	5.76	4.78	5.76	5.66
Molten Lava	M27	2.9	2.18	dead	3.08	2.72
Molten Lava	M9	2.79	2.87	2.5	2.93	2.77
Molten Lava	M26	3.31	3.77	3.97	3.81	3.72
Molten Lava	B118	3.7	5.25	4.5	3.33	4.2
Molten Lava	M111	4.16	4.28	3.28	4.52	4.06
Molten Lava	CG228	4.48	4.25	2.89	4.48	4.03
Molten Lava	DomSdl	3.7	3.78	3.34	4.3	3.78
M. zumi x calocarpa	M27	3.04	dead	msg	msg	3.04
M. zumi x calocarpa	M9	4.27	3.9	3.45	3.12	3.69
M. zumi x calocarpa	M26	4.91	3.21	4.93	6.23	4.82
M. zumi x calocarpa	B118	5.93	5.36	6.36	6.16	5.95
M. zumi x calocarpa	M111	5.98	5.18	5.7	6.28	5.79
M. zumi x calocarpa	CG778	4.26	4.26	dead	4.41	4.31
M. zumi x calocarpa	DomSdl	5.77	4.6	5.78	5.52	5.42
Christmas Holly	M27	2.07	1.59	dead	dead	1.83
Christmas Holly	M9	3.19	3.34	2.91	2.99	3.11
Christmas Holly	M26	4.2	3.16	2.53	4.45	3.59

Christmas Holly	B118	5.82	5.11	4.01	4.66	4.9
Christmas Holly	M111	4.35	4.6	3.11	3.59	3.91
Christmas Holly	B490	4.69	4.11	4.58	5.17	4.64
Christmas Holly	DomSdl	4.59	4.39	4.52	5.07	4.64
Prairifire	M27	2.34	2.16	1.8	dead	2.1
Prairifire	M9	3.26	2.33	3.06	1.78	2.61
Prairifire	M26	4.03	3.38	2.83	3.59	3.46
Prairifire	B118	5.37	4.35	4.82	4.55	4.77
Prairifire	M111	5.1	5.22	4.36	4.88	4.89
Prairifire	CG228	4.26	3.96	4.1	3.88	4.05
Prairifire	DomSdl	4.49	4.52	3.47	3.98	4.12
Golden Raindrops	M27	3.53	4.38	dead	4.48	4.13
Golden Raindrops	M9	msg	dead	3.81	5.76	4.79
Golden Raindrops	M26	4.79	6.21	2.73	5.58	4.83
Golden Raindrops	B118	6.79	5.9	5.62	6.02	6.08
Golden Raindrops	M111	7.02	6.54	5.71	7.31	6.65
Golden Raindrops	B490	6.4	6.68	4.88	7.12	6.27
Golden Raindrops	DomSdl	6.71	5.9	5.21	5.66	5.87

10/2002 Rev. 12/2014